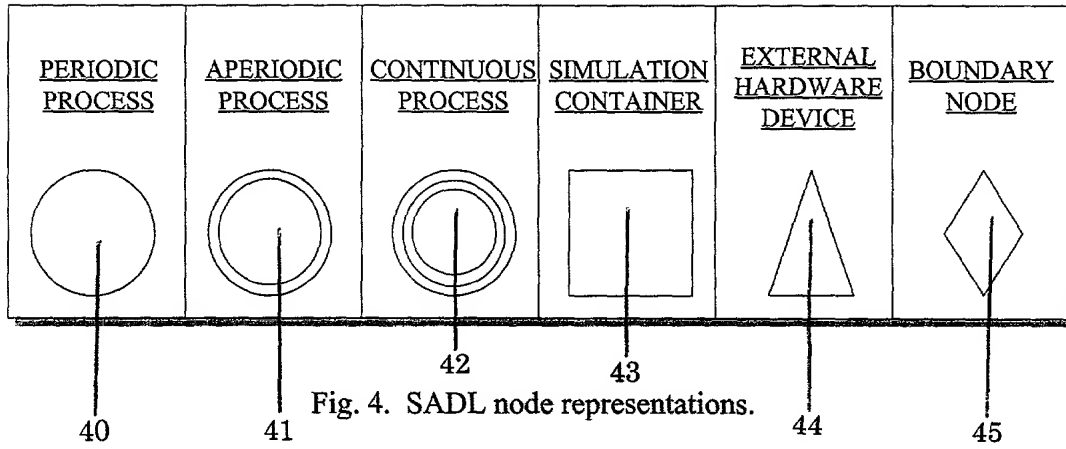


Fig. 2



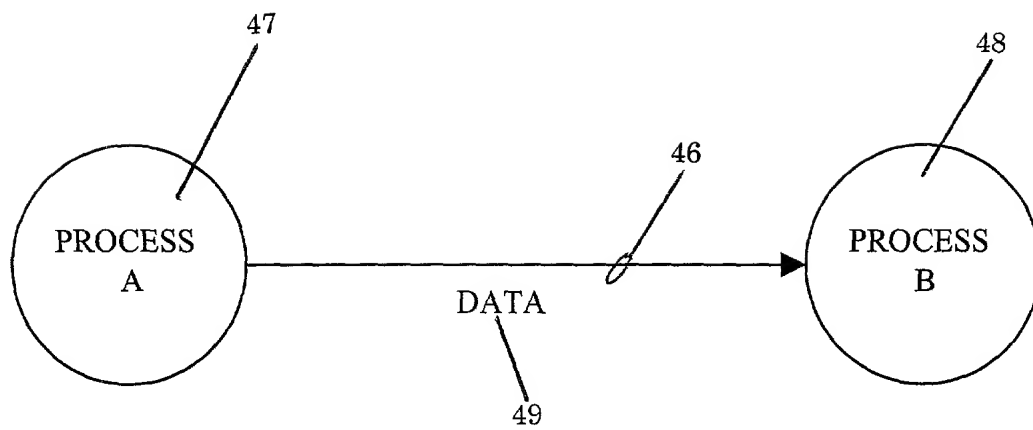


Fig. 5. Periodic process A transfers data to periodic process B.

Fig. 6. The semantics of two periodic processes synchronizing.

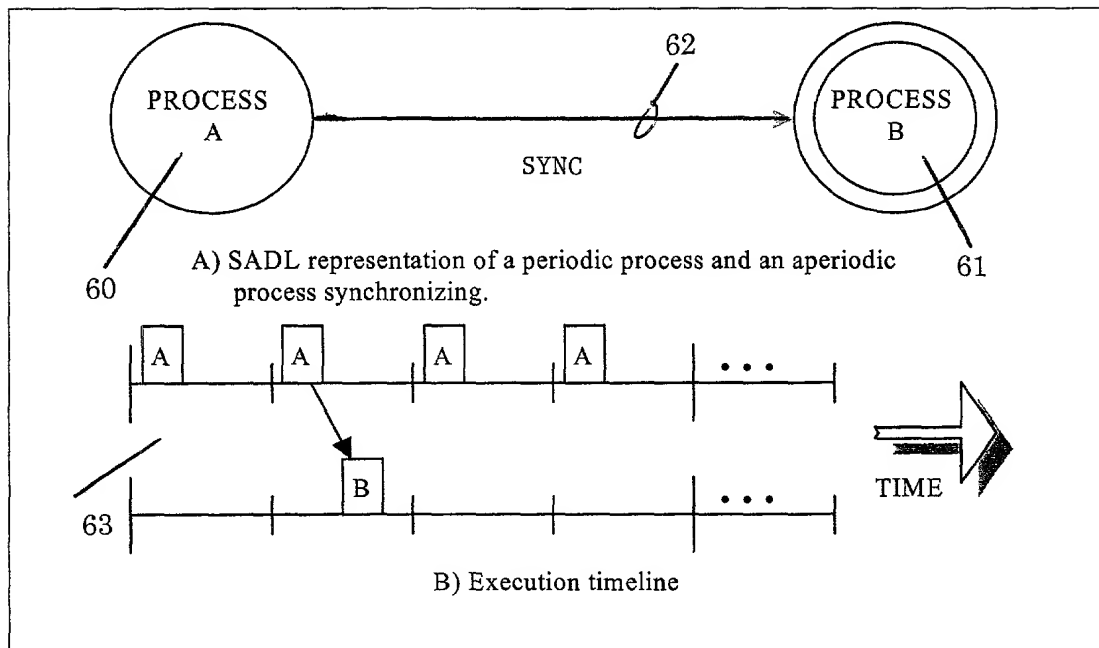


Fig. 7. Aperiodic process B requires synchronization from periodic process A.

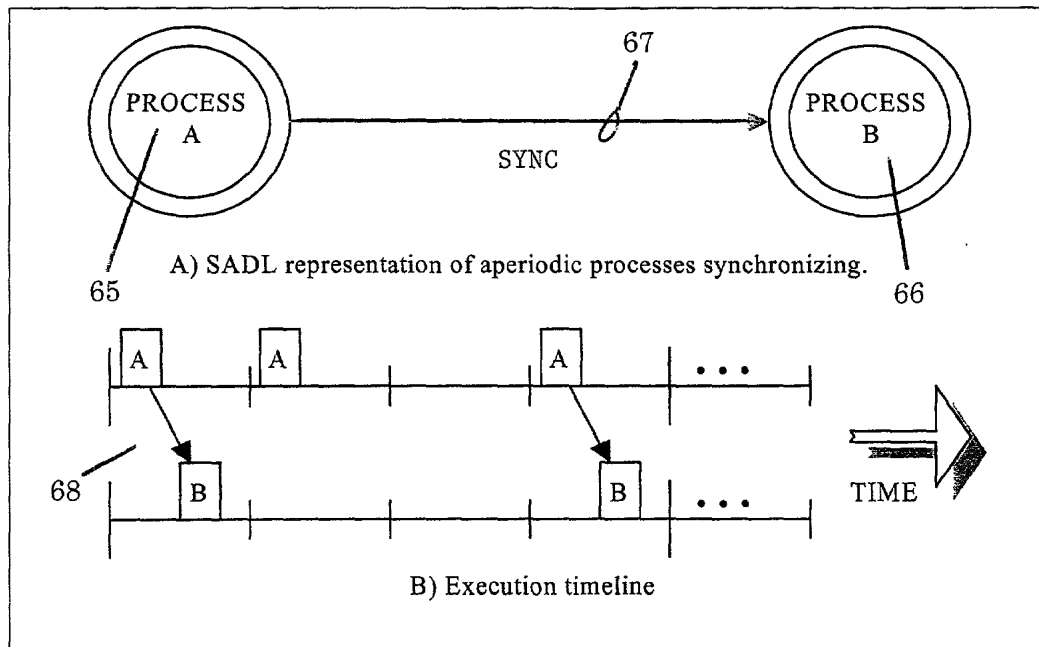


Fig. 8. Synchronization between two aperiodic processes.

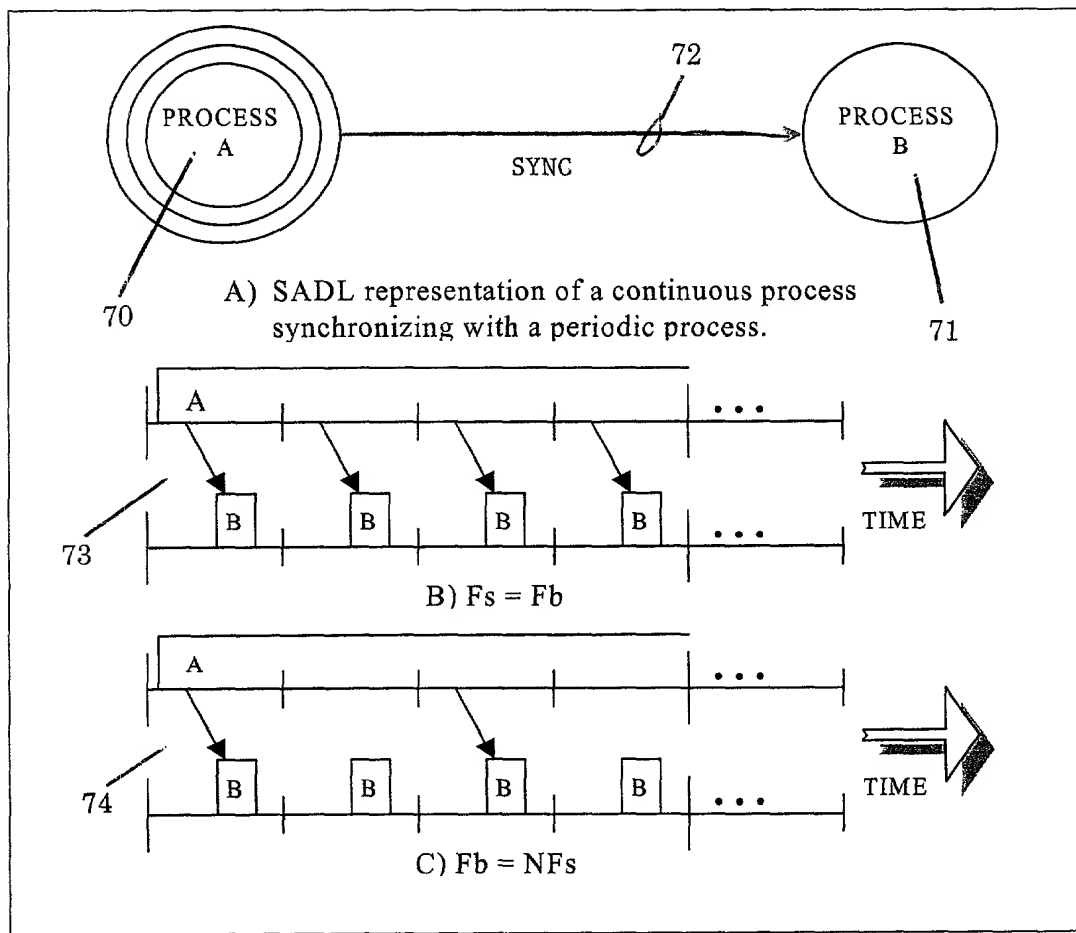


Fig. 9. A continuous process synchronizing with a periodic process.

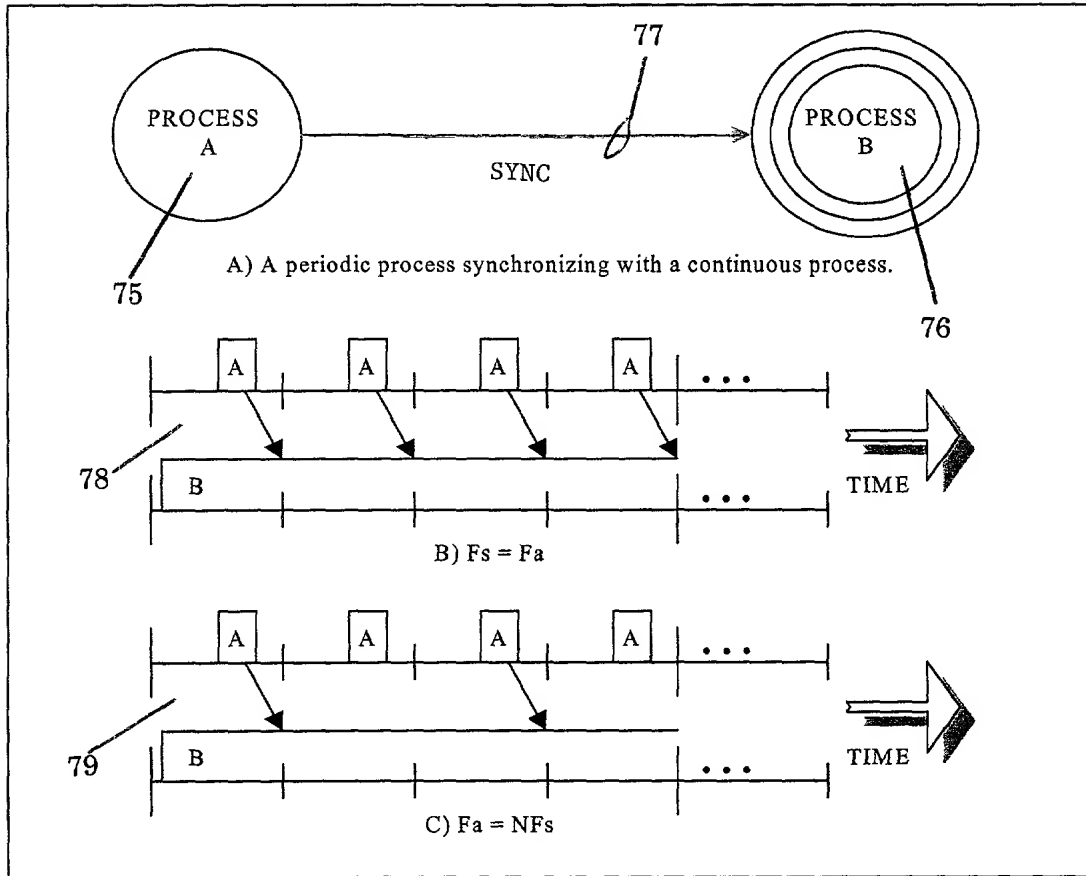


Fig. 10. Synchronization from a periodic process to a continuous process.

80

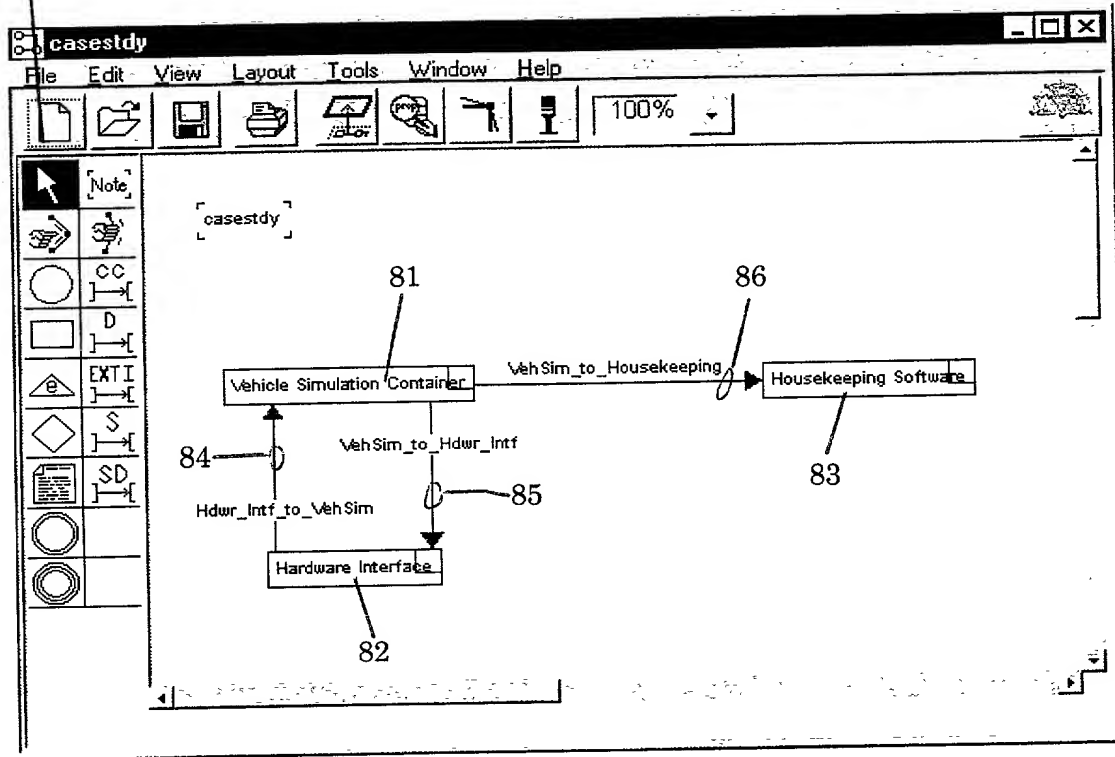


Fig. 11. Top-level description of the architecture of the simulation.

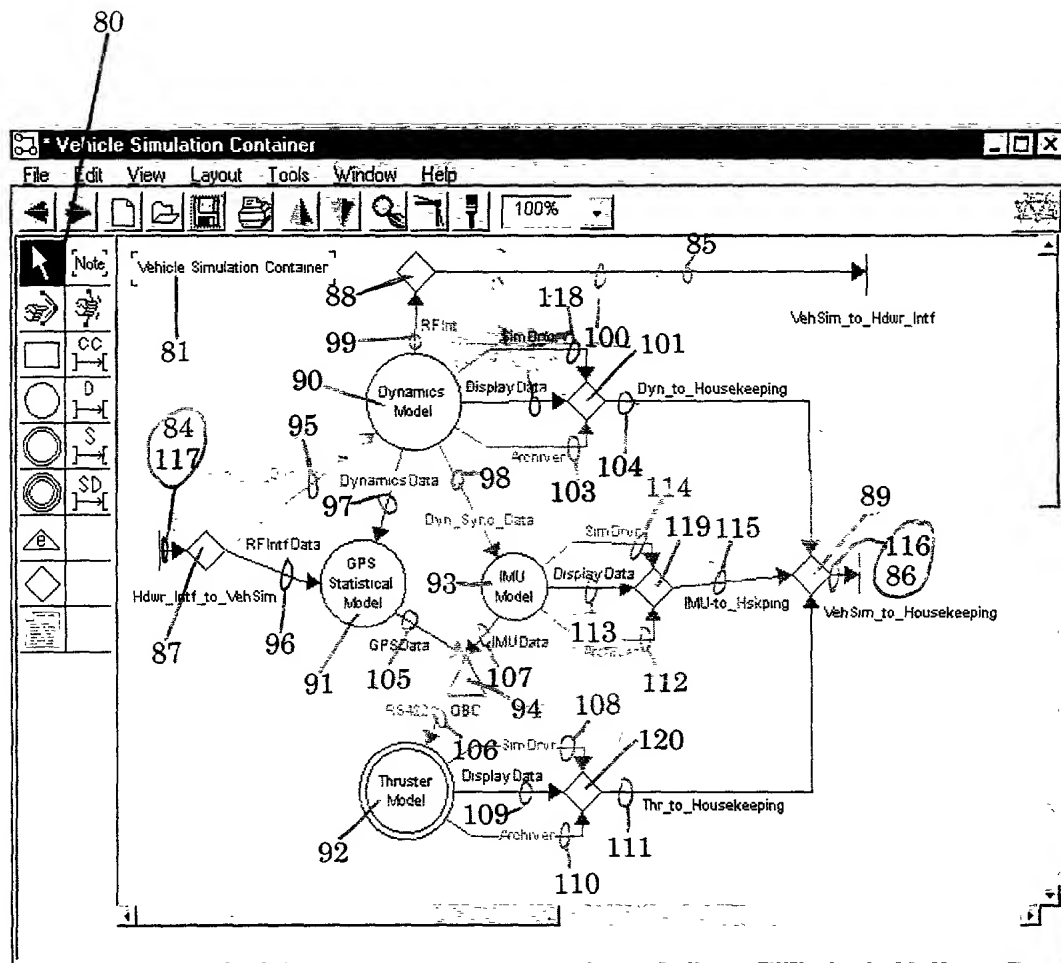


Fig. 12. The vehicle simulation portion of the design.

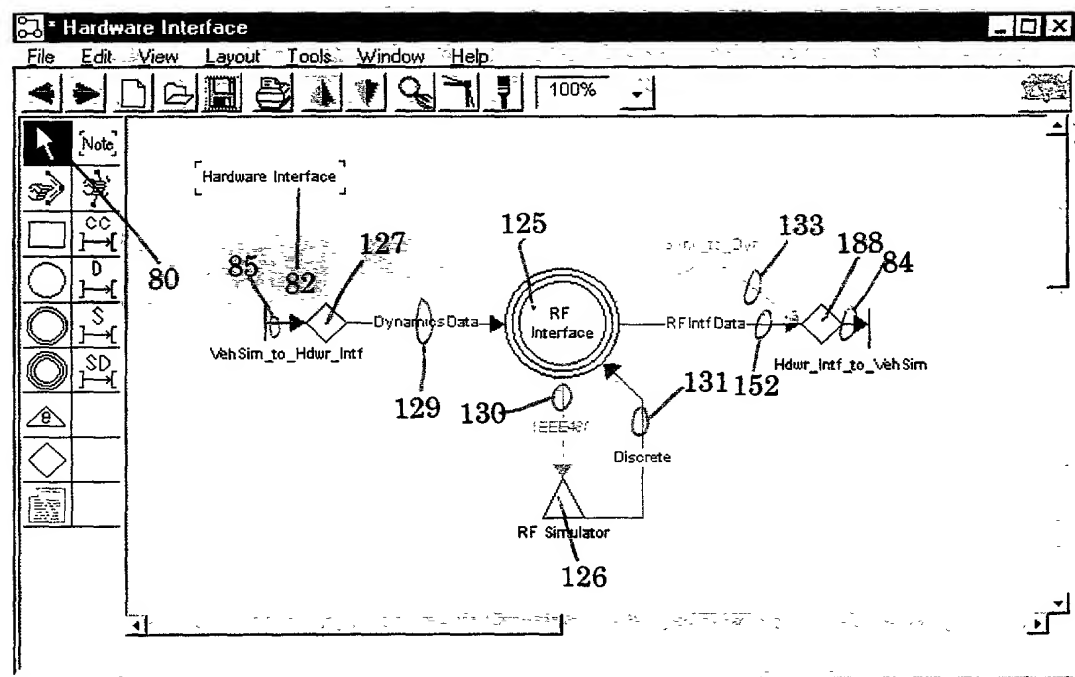


Fig. 13. The hardware interface portion of the design.

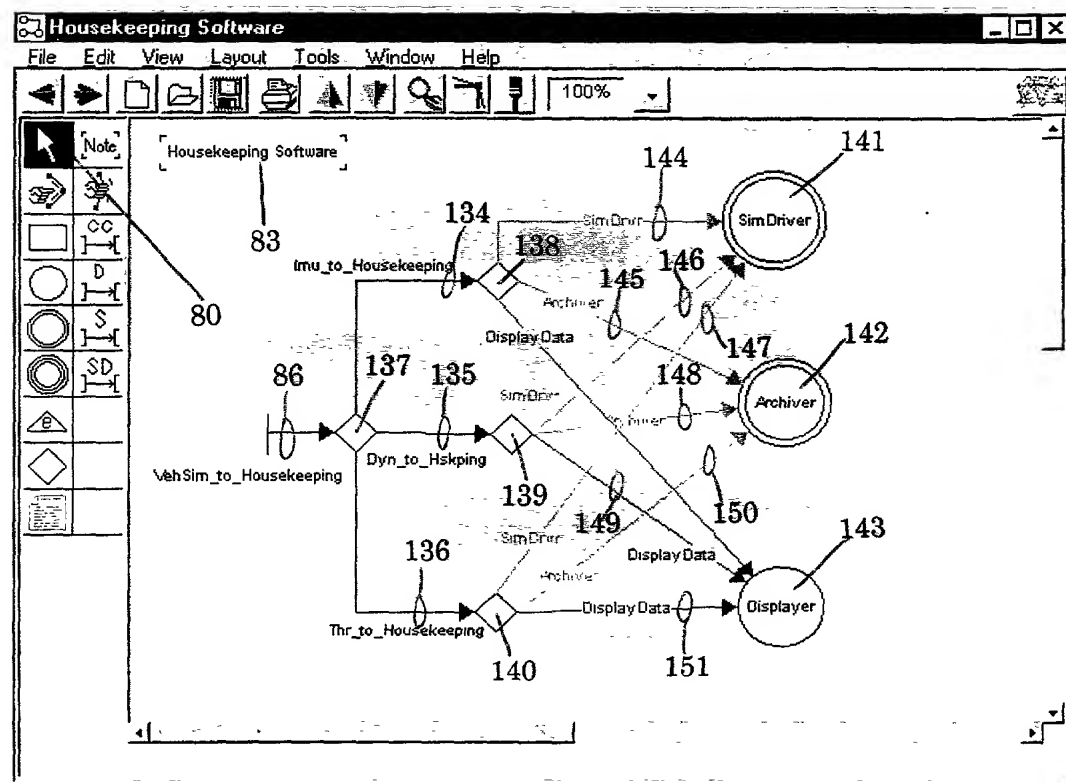


Fig. 14. The housekeeping software portion of the design.

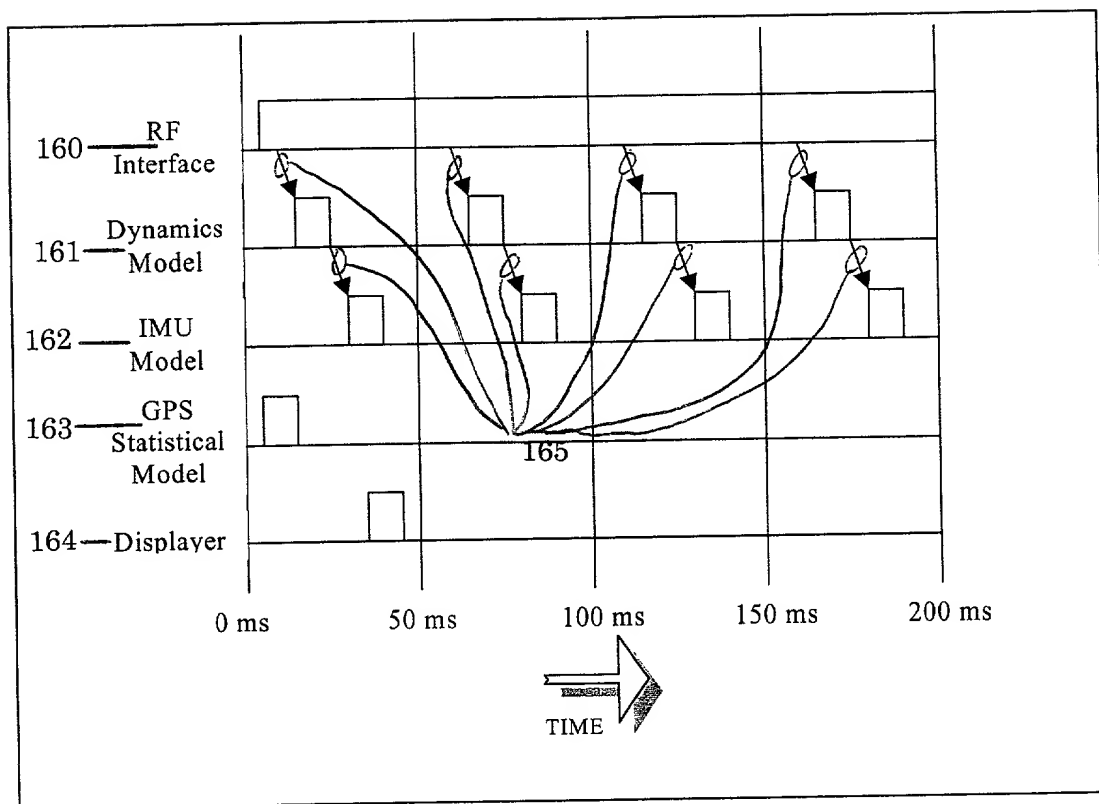


Fig. 15. Execution timeline for AR&C simulation.

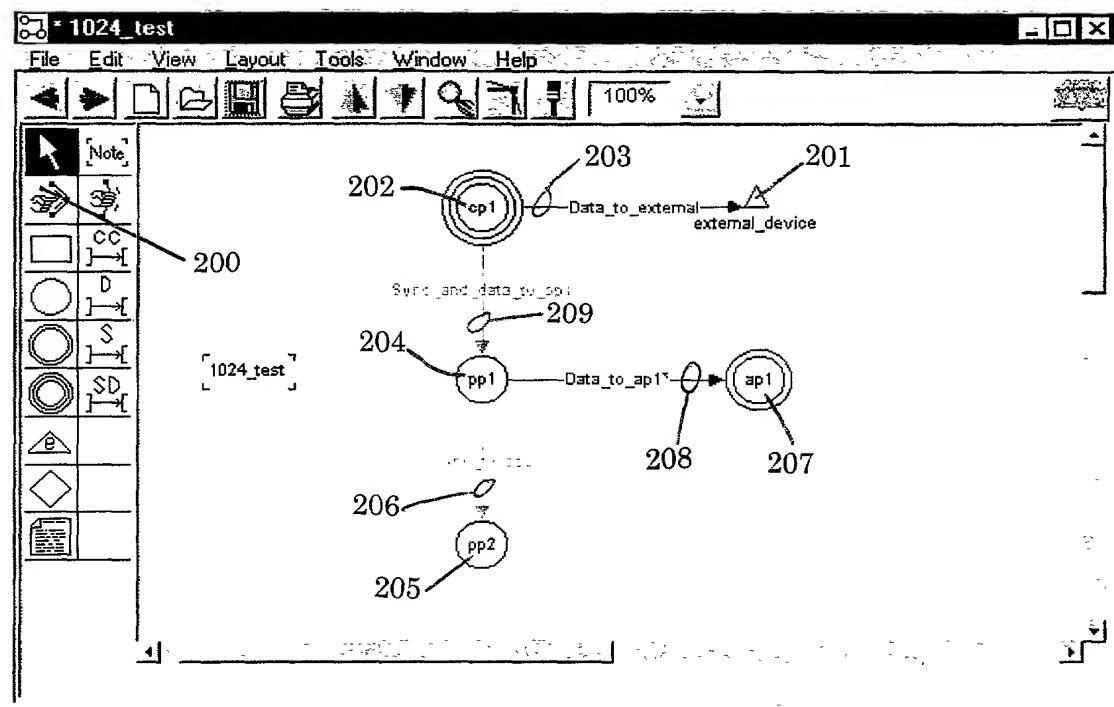


Fig. 16

Cont_process

File Edit View

Name: cp1

Name	Description	Rationale	Traceability
Color	X-Refs	Overlays	Properties

210

Priority: ☐ 100

Processor: ☐ 1

Immediate Predecessors: ☒ nil

Command line arguments: ☒

Pathname: ☐ /home/ricks/

Apply

Fig 17.

Per_process

File Edit View

Name: pp2

Name	Description	Rationale	Traceability
Color	X-Refs	Overlays	Properties

Command line arguments:

211 Duration: 10

FRS Status: 0

Pathname: /home/ricks/

Frequency: 50

Deadline: 10

Processor: 4

Apply

Fig 18.

Per_process [] [] [X]

File Edit View

Name: pp1

Name	Description	Rationale	Traceability
Color	X-Refs	Overlays	Properties

Command line arguments: ☒ []

212 Duration: ☐ 10

FRS Status: ☒ 0 [] [] []

Pathname: ☐ /home/ricks/

Frequency: ☐ 20

Deadline: ☐ 10

Processor: ☐ 2

[Apply]

Fig. 19

Aper_process [Icons]

File Edit View

Name:

Name	Description	Rationale	Traceability
Color	X-Refs	Overlays	Properties

213 Duration: ☐ 5

Command line arguments: ☒

Priority: ☐ 50

Pathname: ☐ /home/ricks/

Deadline: ☐ 20

Processor: ☐ 3

Immediate Predecessors: ☒ nil

Fig 20.

SyncData [Window Title Bar]

File Edit View [Menu Bar]

Name: Sync_and_data_to_pp1

Name	Description	Rationale	Traceability
Color	X-Refs	Overlays	Properties

Frequency: ☐ 20

Releasetime: ☒ 0

214

Apply [Button]

Fig . 21

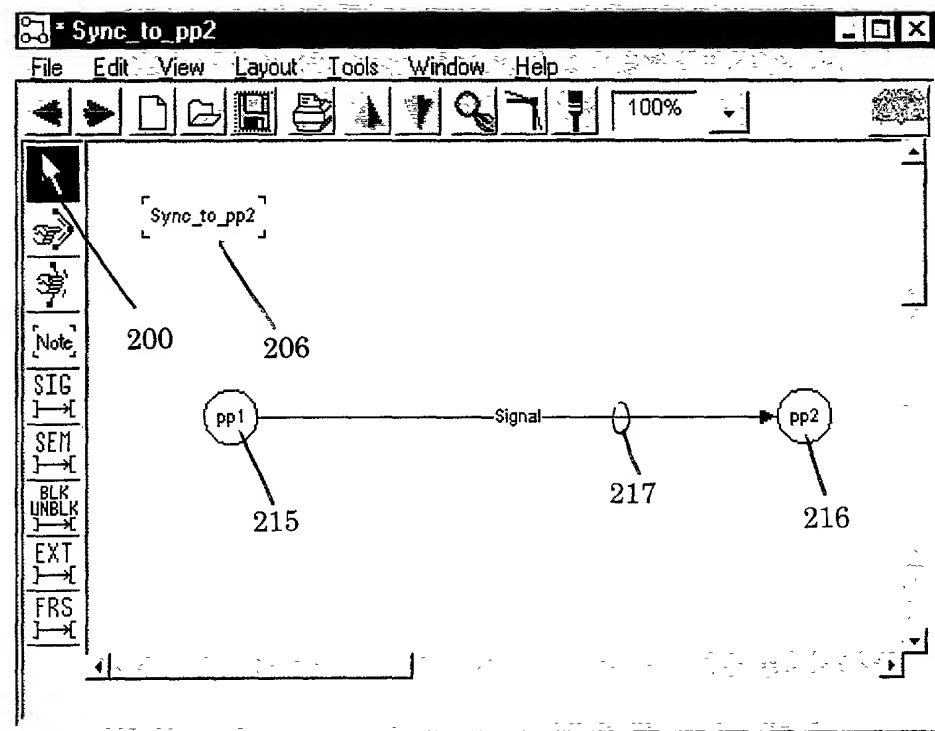


Fig. 22

Sync

File Edit View

Name: Sync_to_pp2

Name	Description	Rationale	Traceability
Color	X-Refs	Overlays	Properties

Frequency: ☐ 20

Releasetime: ☒ 0

218

Apply

Fig. 23

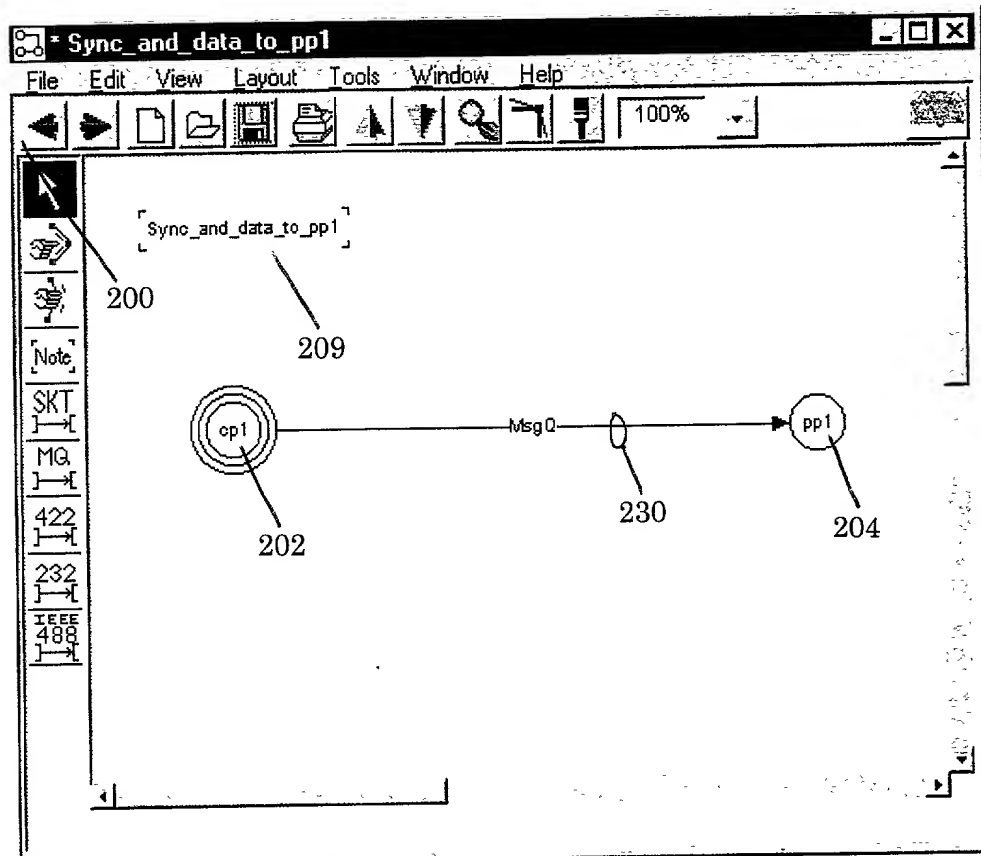


Fig. 24

The screenshot shows a window titled "MsgQueue" with a menu bar containing "File", "Edit", and "View". Below the menu bar is a "Name:" label followed by a text box containing "MsgQ". Underneath is a tabbed interface with two tabs: "Name" (selected) and "Description". The "Name" tab contains a "Depth:" label with a dropdown menu set to "1", and a "Data:" label with a text box containing "nil". A line points from the "Data:" label to the "nil" text. At the bottom right of the window is an "Apply" button.

Name	Description	Rationale	Traceability
Color	X-Refs	Overlays	Properties

Depth: 1

Data: nil

219

Apply

Fig. 25

Socket

File Edit View

Name: new Socket

Name	Description	Rationale	Traceability
Color	X-Refs	Overlays	Properties

Data: ☒

nil

220

PortNumber: ☒ 0

Apply

Fig. 26

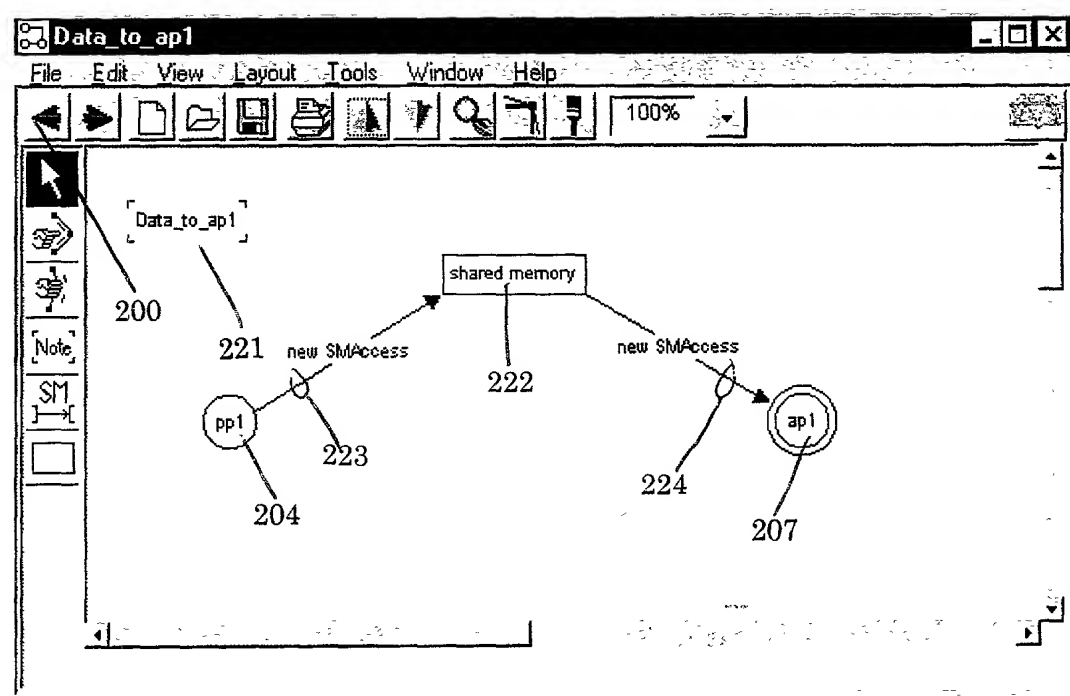


Fig. 27

SMAccess [Icons]

File Edit View

Name: **new SMAccess**

Name	Description	Rationale	Traceability
Color	X-Refs	Overlays	Properties

Data: ☒

225

Apply

Fig. 28

SharedMem

File Edit View

Name: shared memory

Name	Description	Rationale	Traceability
Color	X-Refs	Overlays	Properties

Data:

226

Apply

Fig. 29

```

Per_process "pp1"
  Processor 2
  Priority 0
  Commandlineargs ""
  Pathname "/home/ricks/"
  Frequency 20
  Duration 10
  Deadline 10
  Immediate_Predecessors
"ppp2"
  End_Immediate_Predecessors
  FRSSStatus 0
  Incomingarcs
    Sync_and_data_to_pp1
  End_Incomingarcs
  Outgoingarcs
    Data_to_ap1
    Sync_to_pp2
  End_Outgoingarcs
End_Per_process

Per_process "pp2"
  Processor 4
  Priority 0
  Commandlineargs ""
  Pathname "/home/ricks/"
  Frequency 50
  Duration 10
  Deadline 10
  Immediate_Predecessors
"nil"
  End_Immediate_Predecessors
  FRSSStatus 0
  Incomingarcs
    Sync_to_pp2
  End_Incomingarcs
  Outgoingarcs
  End_Outgoingarcs
End_Per_process

Aper_process "ap1"
  Processor 3
  Priority 50
  Commandlineargs ""
  Pathname "/home/ricks/"
  Duration 5
  Deadline 20
  Immediate_Predecessors
"nil"
  End_Immediate_Predecessors
  Incomingarcs
    Data_to_ap1
  End_Incomingarcs
  Outgoingarcs
  End_Outgoingarcs
End_Aper_process

```

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```

Cont_process "cp1"
  Processor 1
  Priority 100
  Commandlineargs ""
  Pathname "/home/ricks/"
  Immediate_Predecessors
"nil"
  End_Immediate_Predecessors
  Incomingarcs
  End_Incomingarcs
  Outgoingarcs
    Sync_and_data_to_pp1
    Data_to_external
  End_Outgoingarcs
End_Cont_process

External "external_device"
  Incomingarcs
    Data_to_external
  End_Incomingarcs
  Outgoingarcs
  End_Outgoingarcs
End_External

Data "Data_to_ap1"
  Origin "pp1"
  Destination "ap1"
End_Data

SyncData "Sync_and_data_to_pp1"
  Frequency 20
  Releasetime 0
  Origin "cp1"
  Destination "pp1"
End_SyncData

Sync "Sync_to_pp2"
  Frequency 20
  Releasetime 0
  Origin "pp1"
  Destination "pp2"
End_Sync

Data "Data_to_external"
  Origin "cp1"
  Destination "external_device"
End_Data

Signal "Signal"
  Origin "pp1"
  Destination "pp2"
End_Signal

```

Sheet 31 of 35

```

MsgQueue "MsgQ"
  Origin "cp1"
  Destination "pp1"
  Depth 1
  Data
"nil"
  End_Data
End_MsgQueue

```

```

Per_process "pp1"
  Processor 2
  Priority 0
  Commandlineargs ""
  Pathname "/home/ricks/"
  Frequency 20
  Duration 10
  Deadline 10
  Immediate_Predecessors
"ppp2"
  End_Immediate_Predecessors
  FRSSStatus 0
  Incomingarcs
  End_Incomingarcs
  Outgoingarcs
    new SMAccess
  End_Outgoingarcs
End_Per_process

```

```

Aper_process "ap1"
  Processor 3
  Priority 50
  Commandlineargs ""
  Pathname "/home/ricks/"
  Duration 5
  Deadline 20
  Immediate_Predecessors
"nil"
  End_Immediate_Predecessors
  Incomingarcs
    new SMAccess
  End_Incomingarcs
  Outgoingarcs
  End_Outgoingarcs
End_Aper_process

```

```

SharedMem "shared memory"
  Data
nil

```

```

  End_Data
  Incomingarcs
    new SMAccess
  End_Incomingarcs
  Outgoingarcs
    new SMAccess
  End_Outgoingarcs
End_SharedMem

```

Sheet 32 of 35


```
SMAccess "new SMAccess"  
  Origin "pp1"  
  Destination "shared memory"  
  Data  
nil  
  End_Data  
End_SMAccess
```

```
SMAccess "new SMAccess"  
  Origin "shared memory"  
  Destination "ap1"  
  Data  
nil  
  End_Data  
End_SMAccess
```

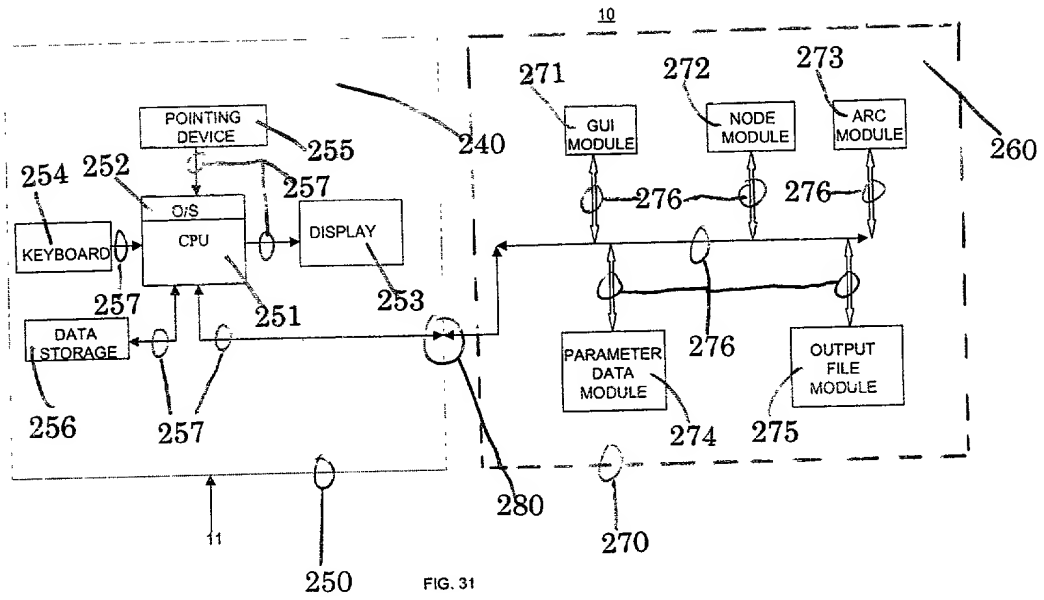


FIG. 31

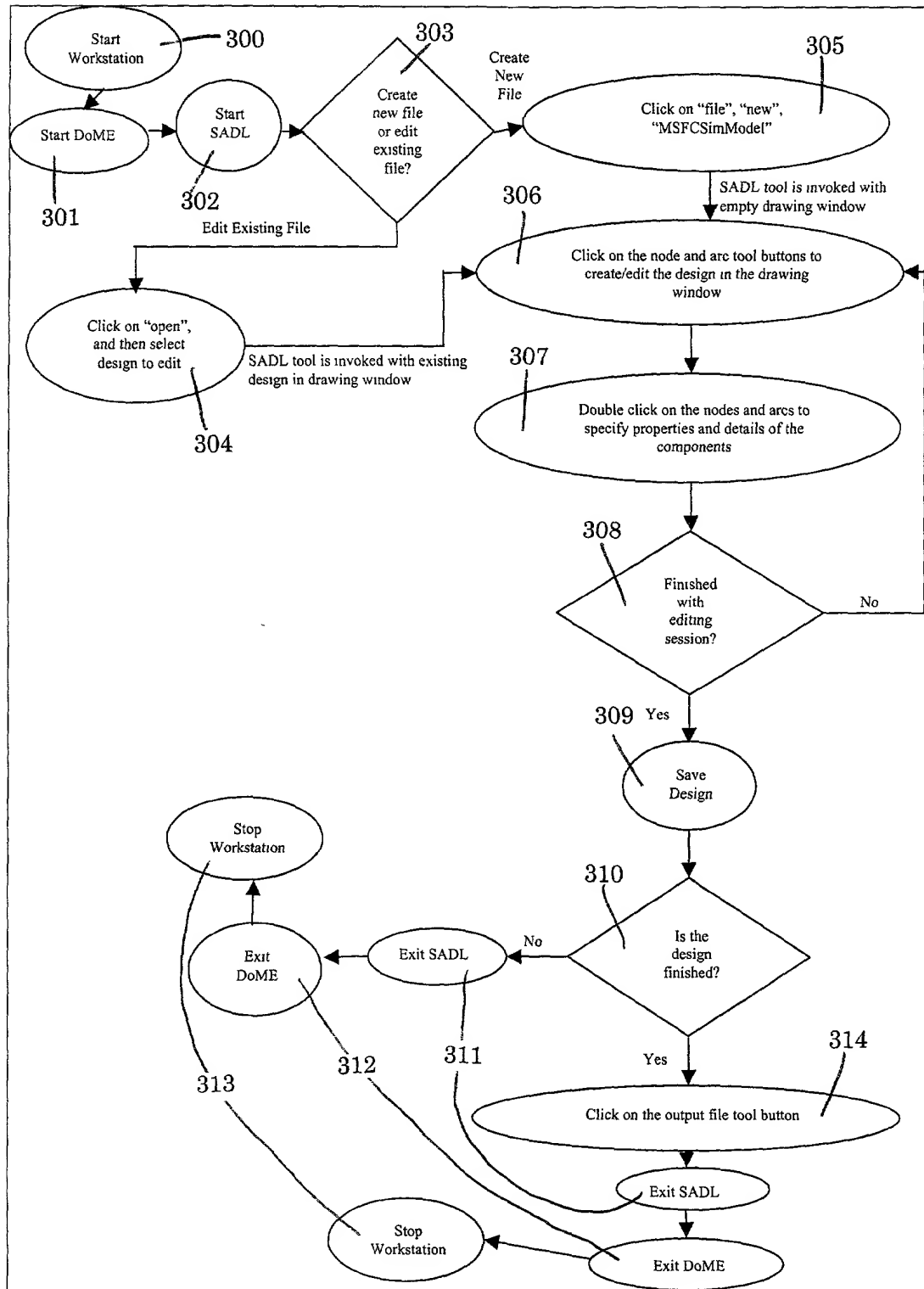


Fig. 32